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| APPLICATION NO                                                                | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO  | CONFIRMATION NO. |
|-------------------------------------------------------------------------------|-------------|----------------------|---------------------|------------------|
| 09 902,518                                                                    | 07 10 2001  | Kegang Huang         | 004180 DD BCVD      | 7428             |
| 32588                                                                         | 7590        | 09 27 2002           |                     |                  |
| APPLIED MATERIALS, INC.<br>2881 SCOTT BLVD. M/S 2061<br>SANTA CLARA, CA 95050 |             |                      | EXAMINER            |                  |
|                                                                               |             |                      | LEBENTRITT, MICHAEL |                  |
|                                                                               |             |                      | ART UNIT            | PAPER NUMBER     |
|                                                                               |             |                      | 2824                |                  |

DATE MAILED: 09 27 2002

Please find below and/or attached an Office communication concerning this application or proceeding.

A2

|                              |                       |              |
|------------------------------|-----------------------|--------------|
| <b>Office Action Summary</b> | Application No.       | Applicant(s) |
|                              | 09/902,518            | HUANG ET AL. |
|                              | Examiner              | Art Unit     |
|                              | Michael S. Lebentritt | 2824         |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM  
**THE MAILING DATE OF THIS COMMUNICATION.**

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1) Responsive to communication(s) filed on \_\_\_\_.  
 2a) This action is FINAL. 2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4) Claim(s) 1-31 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) 13-23 is/are allowed.  
 6) Claim(s) 1,2,4-12,24,25 and 31 is/are rejected.  
 7) Claim(s) 3 and 26-30 is/are objected to.  
 8) Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on \_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 11) The proposed drawing correction filed on \_\_\_\_ is: a) approved b) disapproved by the Examiner.  
 If approved, corrected drawings are required in reply to this Office action.  
 12) The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
 \* See the attached detailed Office action for a list of the certified copies not received.  
 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
 a) The translation of the foreign language provisional application has been received.  
 15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) Notice of References Cited (PTO-892)  
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948) *U*  
 3) Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.  
 4) Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_.  
 5) Notice of Informal Patent Application (PTO-152)  
 6) Other:

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1,2,4-7 are rejected under 35 U.S.C. 102(b) as being anticipated by

Yasuhara, JP11-162969.

Yasuhara discloses forming a low dielectric constant layer (104); introducing a processing gas (106) into a processing chamber, creating a plasma and exposing the low dielectric film to said plasma. Wherein said plasma is comprised of a gas consisting from the list of Ar, Kr, Ne, Xe, N2 and/or He. See abstract

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Yasuhara.

Yasuhara is silent to the flow rates and the power density, time and pressure of the plasma treatment. In regards to these values, Generally, differences in

concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. “[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) (Claimed process which was performed at a temperature between 40°C and 80°C and an acid concentration between 25% and 70% was held to be prima facie obvious over a reference process which differed from the claims only in that the reference process was performed at a temperature of 100°C and an acid concentration of 10%). See also *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in—  
(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or  
(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 24,25 and 31 are rejected under 35 U.S.C. 102(e) as being anticipated by Alok et al, US Patent 6,373,076.

Alok et al discloses forming a SiC layer (104) on the substrate ; depositing a passivating layer comprising silicon and nitrogen on the silicon carbide layer (120).

Wherein the passivating layer comprises silicon nitride or silicon oxyntiride. See figures 1-a-1c and discussion on column 4, line 50 to column 6, line 35

***Allowable Subject Matter***

Claim 3 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: prior art references fail to teach wherein the low dielectric layer comprises silicon carbide.

Claims 26-30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: Alok et al does teach that a surface treatment process could be used instead of ion implantation of inert ions to render the SiC region amorphous but fails to teach: introducing a silicon containing gas and a nitrogen containing gas into a chamber containing the substrate; initiating a plasma in the process chamber; reacting the silicon containing gas and the nitrogen containing gas in the presence of the plasma to deposit the pasivating layer comprising silicon and nitrogen.

Claims 13-23 are allowed.

The following is an examiner's statement of reasons for allowance: prior art references teach several combination of plasma treatments, for example Park et al US 556078, teaches a N<sub>2</sub>+NH<sub>3</sub> plasma or N<sub>2</sub>, N<sub>2</sub>O, O<sub>2</sub>, O<sub>3</sub> or argon plasma treatment of an underlying dielectric layer after patterning a conductive layer. Chooi et al teaches a HDP treatment of FSG, fluorinated polyimide; amorphous fluorocarbon, Parylene or PTFE with nitrogen, hydrazine or NH<sub>3</sub> plasma; Quan et al "Significant improvement of ~~the~~ H<sub>2</sub> +He plasma treatment," teaches plasma treatment of paraxylene with H<sub>2</sub> +He. Chang , US Patent 6,403,464 teaches plasma treatment of FLARE, HOSP, LOSP with nitrogen. And Chang et al, US Patent 6,153,512 teaches plasma treatment of HSQ and PETOES in nitrogen ambient. None of the above references teach either singularly or in combination, modifying a surface of the silicon carbide layer by exposing the silicon carbide layer to the plasma of the processing gas to form a passivating surface of the silicon carbide layer.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael S. Lebentritt whose telephone number is 703-305-2691. The examiner can normally be reached on 5/4/9.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Elms can be reached on 703-308-2816. The fax phone numbers

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for the organization where this application or proceeding is assigned are 703-308-7722

for regular communications and 703-308-7721 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-

1732.



Michael S. Lebentritt  
Primary Examiner  
Art Unit 2824

September 24, 2002